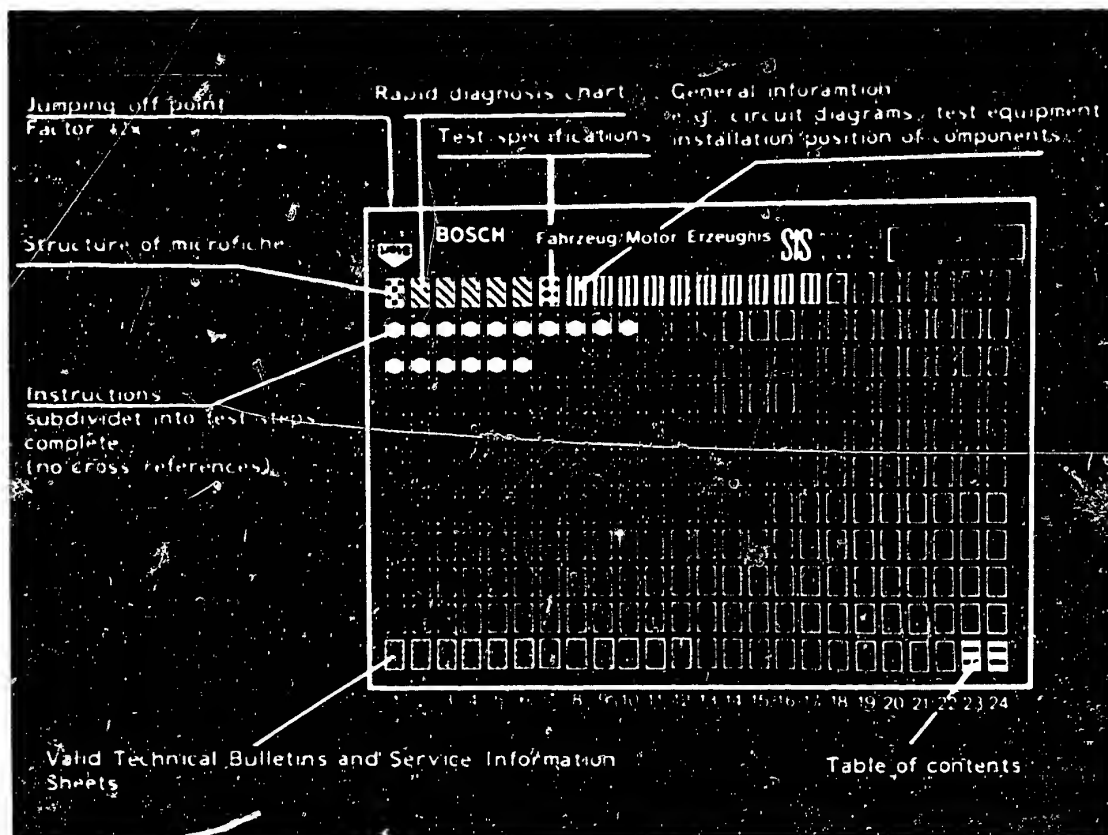


Structure of microfiche



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

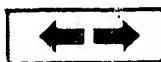
E 16	Product/assembly/test step	
	Vehicle/engine	

Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

C 6

A 1

Trouble-shooting program



1. Rapid diagnosis chart

The following rapid diagnosis chart makes it possible for the experienced expert to quickly check the electrical/electronic part of the ignition system using normal workshop test equipment.

The rapid diagnosis chart contains the following information:

- Customer complaint
- Cause of the trouble
- Test instructions (if no coordinate given on the right, further possibilities for testing are indicated).
- Coordinates for detailed trouble-shooting.

If detailed information and instructions on trouble-shooting are necessary, always proceed according to the trouble-shooting program starting on coordinate B 1.



Rapid diagnosis chart

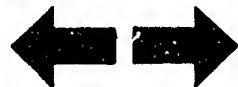
Customer complaint (symptom of trouble)

- 1. Starting motor operates, but engine fails to start
- 2. Rough idling
- 3. Poor throttle response
- 4. Engine lacks power
- 5. Misfiring
- 6. Fuel consumption too high
- 7. Engine pings when accelerating
- 8. Backfiring
- 9. Engine becomes too hot

									Cause of trouble	Test instructions	Coordinates
●	●	●	●	●	●		●		Spark plugs defective	Remove spark plug and make visual examination.	-
●	●	●	●	●	●	●	●	●	Ignition timing incorrect	See Autodata test specifications	-
●	●	●	●	●					Shunt on secondary side	Make visual examination of ignition transformer, ignition distributor, ignition harness and spark plug.	-
●	●	●	●	●					Open circuit on secondary side	Assess ignition transformer, ignition distributor, ignition harness and spark plug by means of continuity test (ohmmeter).	-
●									Open circuit on primary side	Test trigger box voltage supply, and/or primary circuit.	C 3
●	●	●	●	●					Ignition transformer defective	Make visual examination, electrical test	B 5

A3

Rapid diagnosis chart
Lamborghini



A4

Rapid diagnosis chart
Lamborghini



Rapid diagnosis chart

Customer complaint (symptom of trouble)

1. Starting motor operates, but engine fails to start
2. Rough idling
3. Poor throttle response
4. Engine lacks power
5. Misfiring
6. Fuel consumption too high
7. Engine pings when accelerating
8. Backfiring
9. Engine becomes too hot

								9. Engine becomes too hot	Cause of trouble	Test instructions	Coordinates
		●	●	●	●				Interference-suppression resistors defective	Assess by means of resistance measurement.	
	●	●	●		●	●	●	●	Centrifugal advance defective	See Autodata test specifications	
		●	●		●	●		●	Vacuum advance defective	See Autodata test specifications	
●				●					Tachometer defective	Test tachometer	B9 C5
●									Ignition distributor pickup system defective	Pick-up resistance, pick-up winding short circuit to ground, check pick-up system for mechanical damage.	C1
●	●	●	●	●					Engine-speed limiter defective	Test cut-out speed, or perform visual examination	
●									Firing sequence incorrect	See Autodata test specifications	

A5

Rapid diagnosis chart

Lamborghini



A6

Rapid diagnosis chart

Lamborghini



2. Test specifications

Ignition transformer, primary 0.1 ... 0.2 Ω

A5

Ignition transformer, secondary 395 ... 766 Ω

Resistance of
coil section

3.2 ... 5.4 k Ω

C1

Short-circuit to ground
of coil section

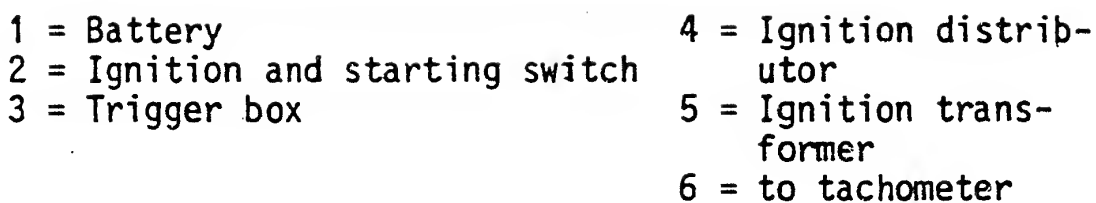
$R = \infty$

See Autodata test specifications for settings for
ignition, idle speed, exhaust gas, valve clearance etc.

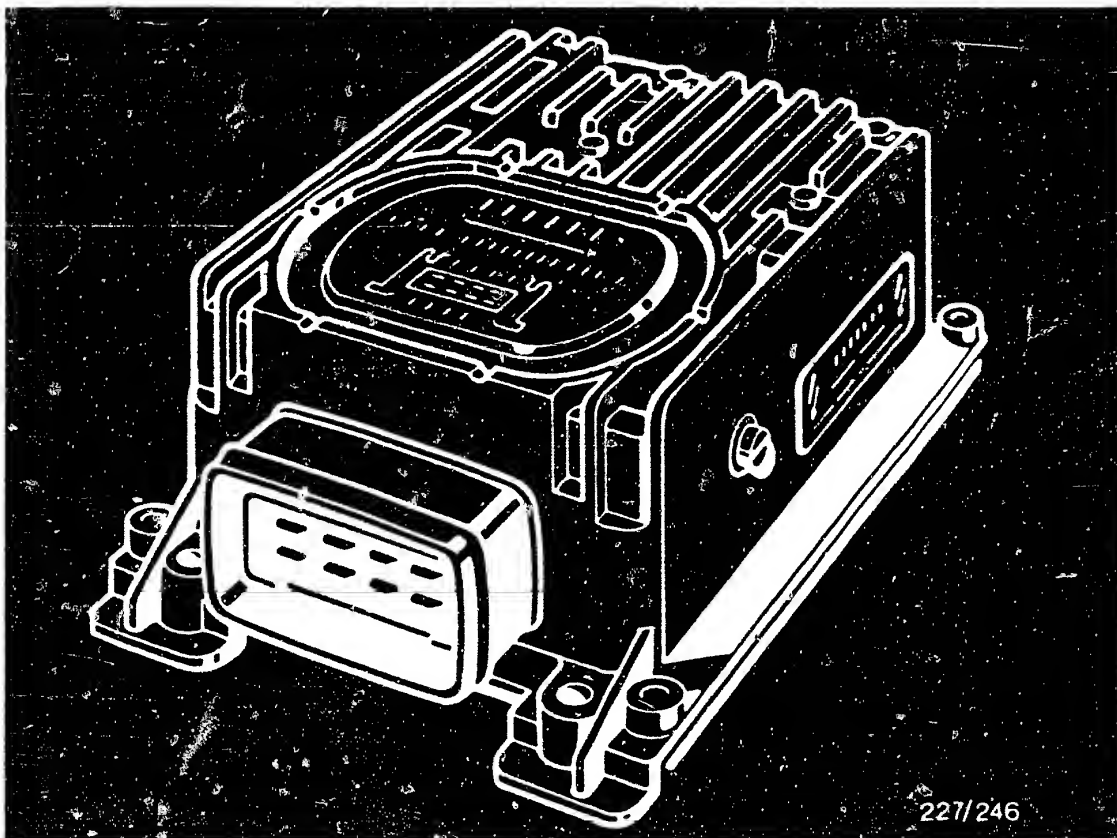
A7

Test specifications
Lamborghini





3. Electrical terminal diagram



227/246

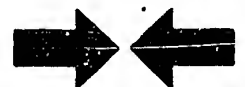
CDI trigger box

4. Installation position of components

The trigger box is mounted in the engine compartment.

5. Necessary test equipment, aids

Motortester	MOT 2 01	0 684 000 201
Spark gap e.g. Ignition coil and condenser tester or Single spark gap	EFAW 106 A EF 1177/7	0 681 100 001 1 684 531 000
5 k Ω sleeve-type suppressor		0 356 500 001
Ohmmeter or e.g.	ETE L14.00 Pontavi Wh2	0 684 101 400 Commercially available
Voltmeter e.g. Test prods	ETE 014.00	0 684 101 400 Commercially available



6. Danger of accident on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts or terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope, etc.).
- Replacing parts of the ignition system (spark plug, ignition transformer, ignition distributor, H.T. ignition cables etc).



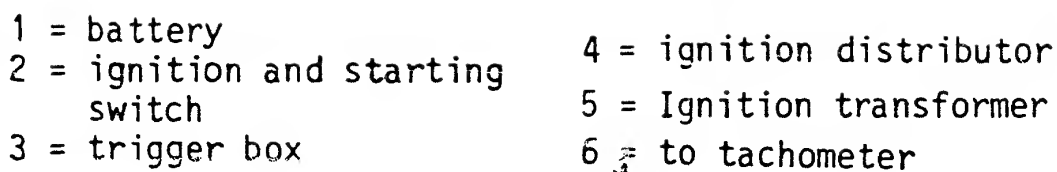
If, while testing the ignition system or during adjustment work on the engine (e.g. carburettor), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

Therefore, the danger of accident exists not only on the individual components of the ignition system (such as ignition distributor, ignition transformer, trigger box, ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and testers.

In the case of capacitor-discharge ignition it must also be remembered that there is also danger:

- when operating the trigger box without ignition transformer
- on the removed trigger box which had been switched on only a short time beforehand (capacitor discharge).





Electrical terminal diagram

The dangerous locations are marked with danger arrows taking the example of the terminal diagram of an electronic ignition system.



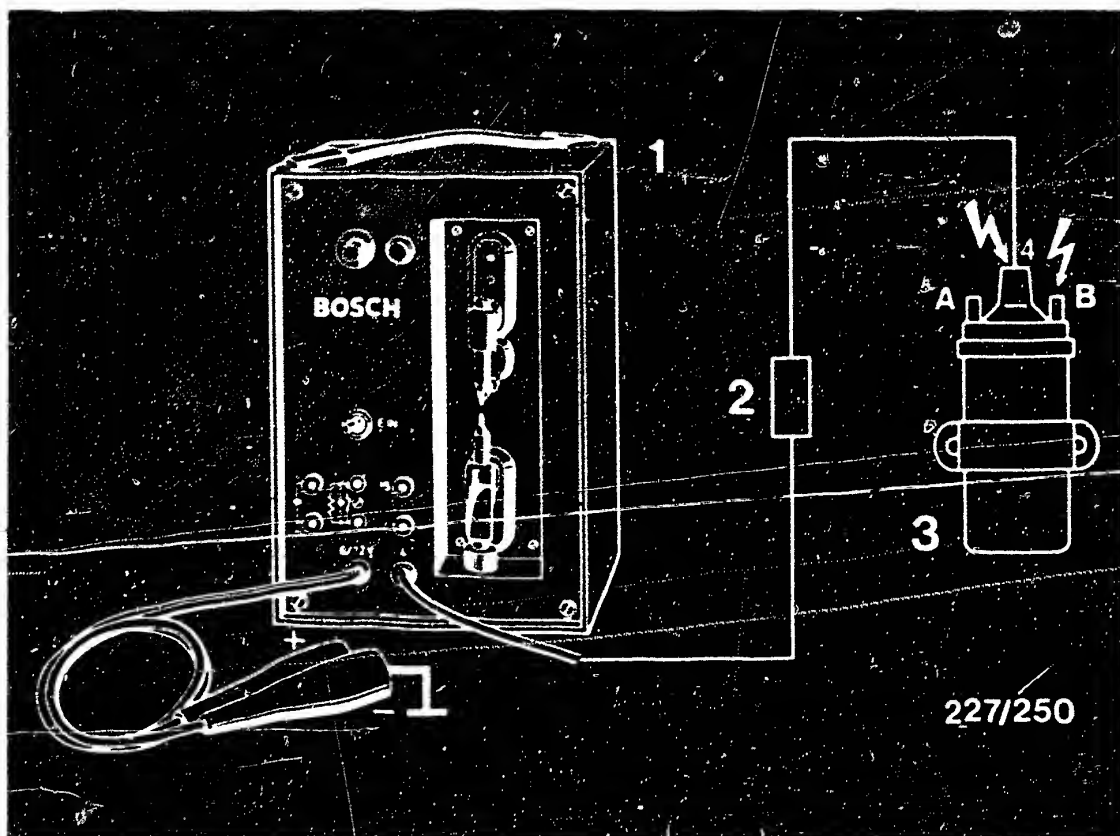
7. Important vehicle information

- During the compression test, remove the trigger-box plug or firmly ground ignition transformer term. 4 using auxiliary cable (dangerous high voltage, insulation damage to ignition transformer, ignition distributor, ignition harness).

Note: Auxiliary cable must be interference-suppressed with at least 1 k Ω e.g. sleeve-type suppressor (5 k Ω) 0 356 500 001.

- Work on the ignition system, e.g. connection and disconnection of leads, must only be performed with the ignition off and with the trigger-box plug removed.
- Resistance measurements must only be performed with the ignition off or with the battery disconnected (measuring instrument defective).
- To prevent the trigger box from being irreparably damaged, the secondary side of the ignition system must have at least 1 k Ω interference suppression per ignition circuit.



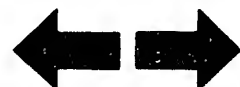


- 1 = Spark gap
- 2 = 5 kΩ sleeve-type suppressor
- 3 = Ignition transformer

⚡ = Dangerous voltages (400 V - 25 kV)

- In order to prevent the trigger box from being irreparably damaged, when using a spark gap, an interference-suppression resistor of at least 1 kΩ must be connected between spark gap and ignition transformer term. 4, e.g. sleeve-type suppressor (5 kΩ)
0 356 500 001.
- In the case of ignition distributors with engine-speed limitation the ignition distributor side terminal 4 must have 1 kΩ interference suppression. Operation without interference suppression will lead to the destruction of the trigger box.

- The holding springs of the distributor cap must not fall into the pulse generator system when the engine is being cranked with the dust-protection cover removed.
- Do not disconnect the battery with the engine running.
- Incorrect polarity of the battery will destroy the trigger box.
- Do not use a starting aid with more than 16 V or a fast charger for starting.
- The specified ignition transformer (see Part No.) must not be replaced by a different ignition transformer or an ignition coil.
- Under no circumstances must any devices, such as suppression capacitor, stroboscope, test lamp etc be connected to terminal A of the ignition transformer since there is up to 450 V across terminal A. When running, engines must not be switched off by using a wire jumper or a tool between terminal A (ignition transformer) and ground. Such actions will inevitably lead to the destruction of electronic components. Even after switching off the trigger box (ignition off) the lead to the ignition transformer (terminal A) must not be brought into contact with vehicle ground.
- The trigger box must not be operated without ignition transformer.



- Ignition cable from ignition transformer term. 4 to ignition distributor term. 4 must not be disconnected during operation.
- A 2.2 μF capacitor is installed in the CDI trigger box for radio interference suppression.
- The lead between induction-type pulse generator and trigger box must be shielded (malfunction of trigger box).
- To prevent misfiring (through capacitive interference), original ignition cables must be used.



9. Trouble-shooting program

Procedure

The trouble-shooting program is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanation of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "Yes", then proceed to the next test down.

If the answer to the question is "No", branch to the center row and carry out the tests given there.

Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e.g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to +100 °C (temperature has a considerable effect on measured values).



Beginning of trouble-shooting program

Starting motor operates, engine fails to start or misfires or lacks power.

Yes

Continued on B 3

B2

Trouble-shooting program

Lamborghini



yes

Test ignition spark.
Remove H.T. ignition cable term. 4 from
ignition transformer.
Connect spark gap including sleeve-type
suppressor (5 k Ω) to ignition transformer.
Adjust spark gap to 5 mm.
Start engine.
There must be sparks across the spark gap.
Ignition sparks across spark gap?

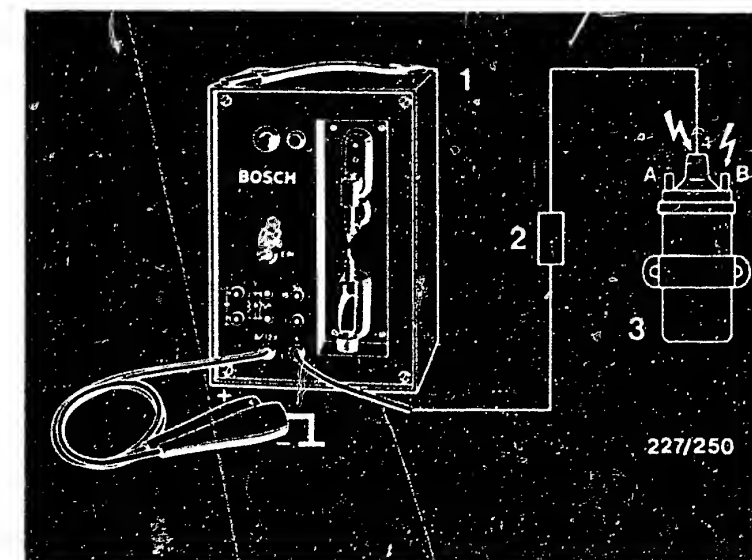
no

If no ignition spark, continue test-
ing at C1.

Tests as from B5 not necessary.

yes

Continued on B5/B6



1 = Spark gap
2 = 5 k Ω sleeve-type suppressor
3 = Ignition transformer



= dangerous voltages
(400 V - 25 kV)

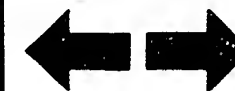
B3

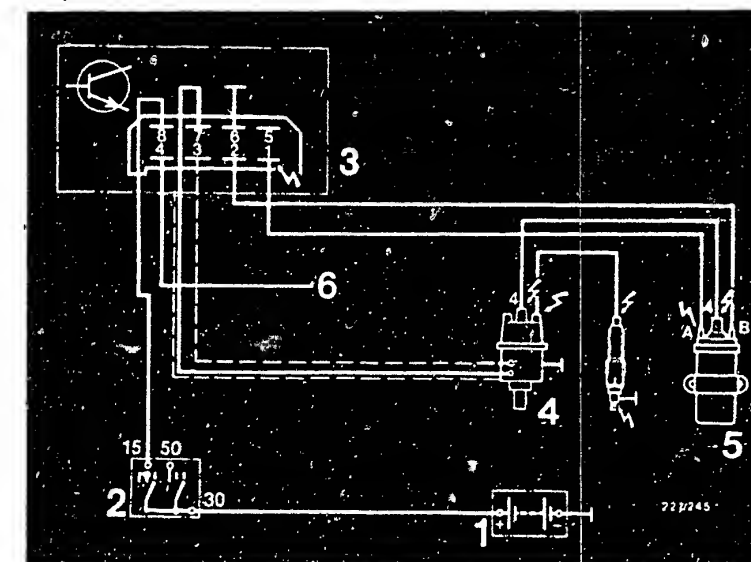
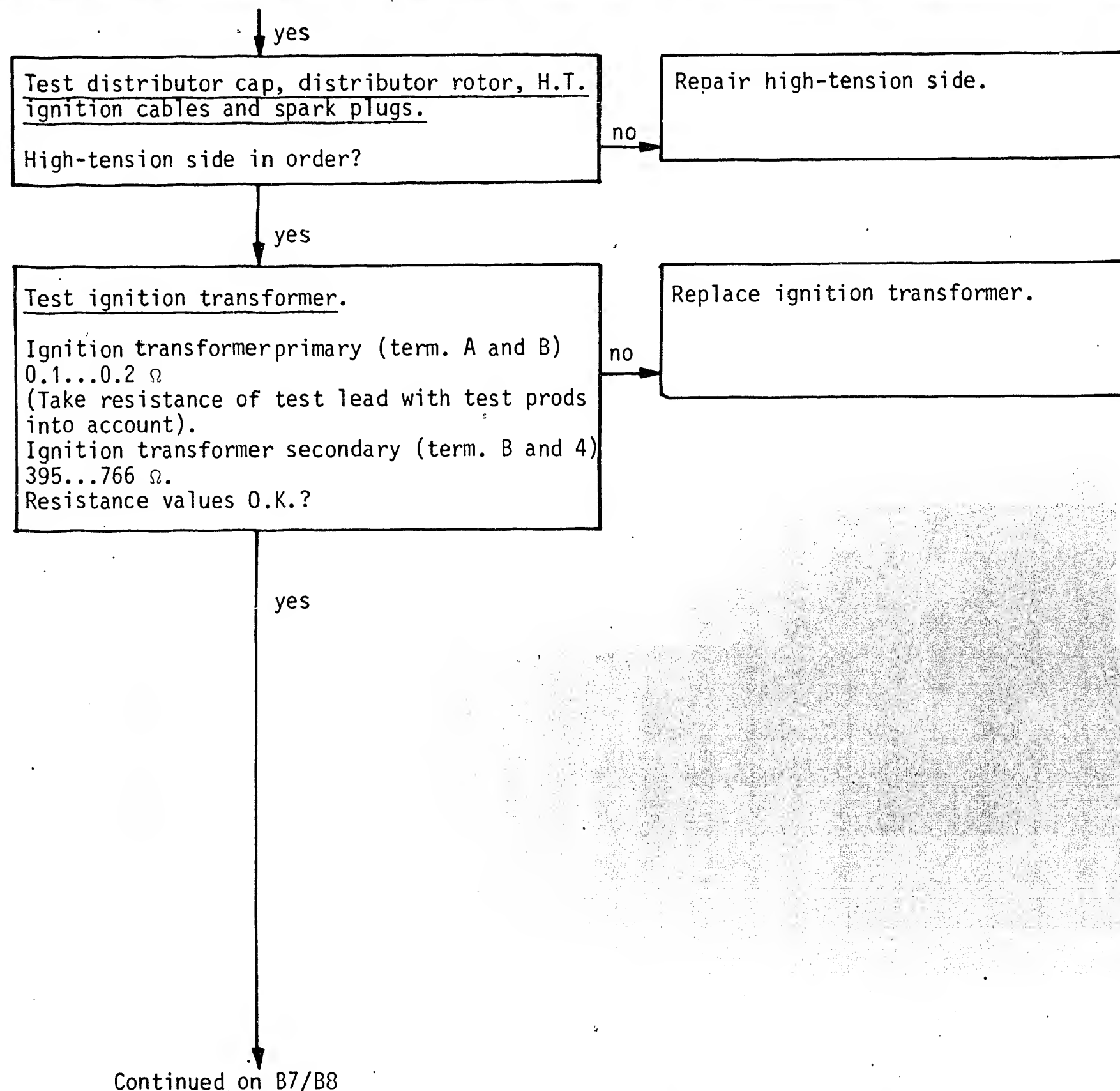
Trouble-shooting program
Lamborghini



B4

Trouble-shooting program
Lamborghini





- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition distributor
- 5 = Ignition transformer
- 6 = to tachometer

⚡ = dangerous voltages
(400 V - 25 kV)

B5

Trouble-shooting program

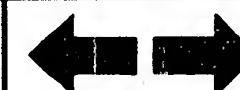
Lamborghini

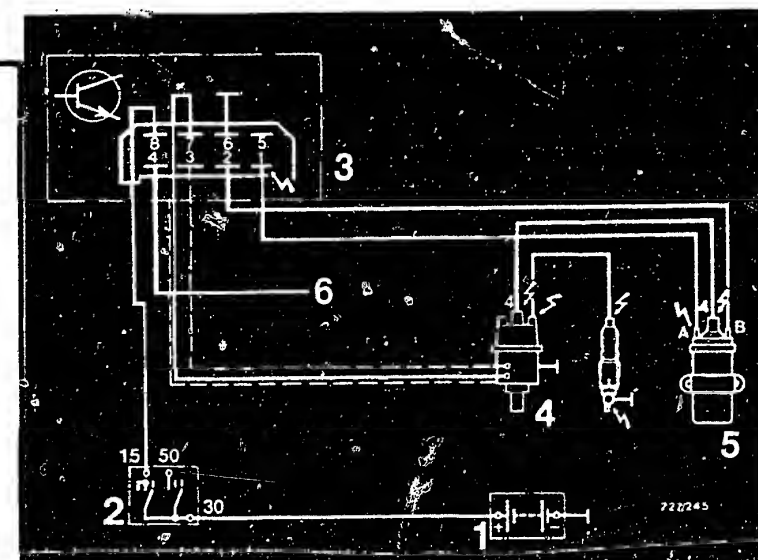
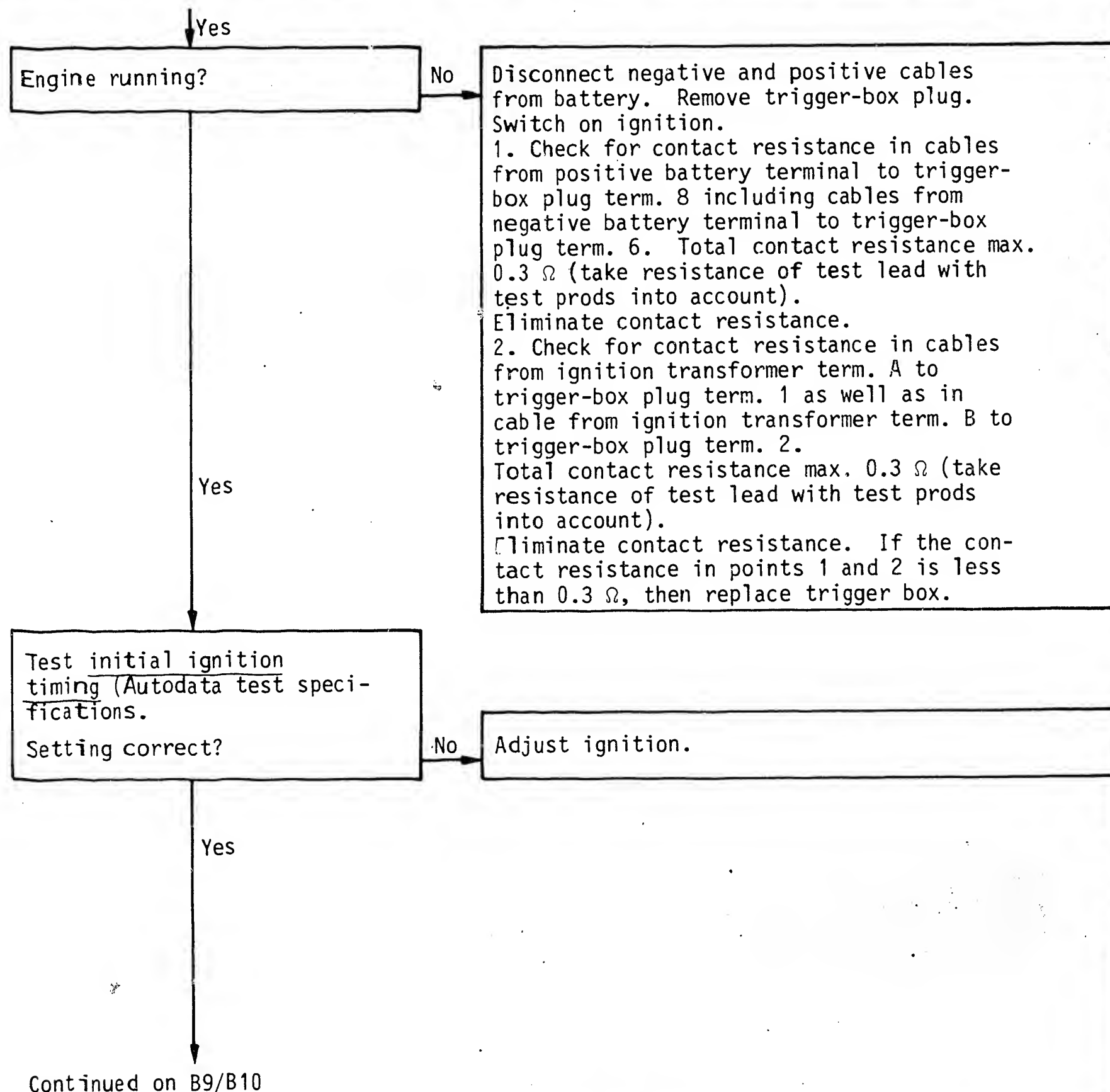


B6

Trouble-shooting program

Lamborghini

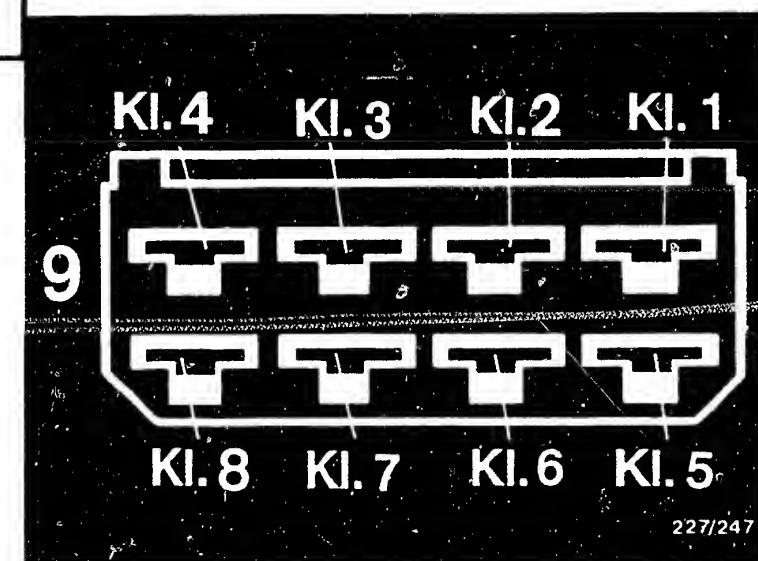




- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition distributor
- 5 = Ignition transformer
- 6 = to tachometer

⚡ = Dangerous voltages
(400 V - 25 kV)

9 = Trigger-box plug



Continued on B9/B10

B7

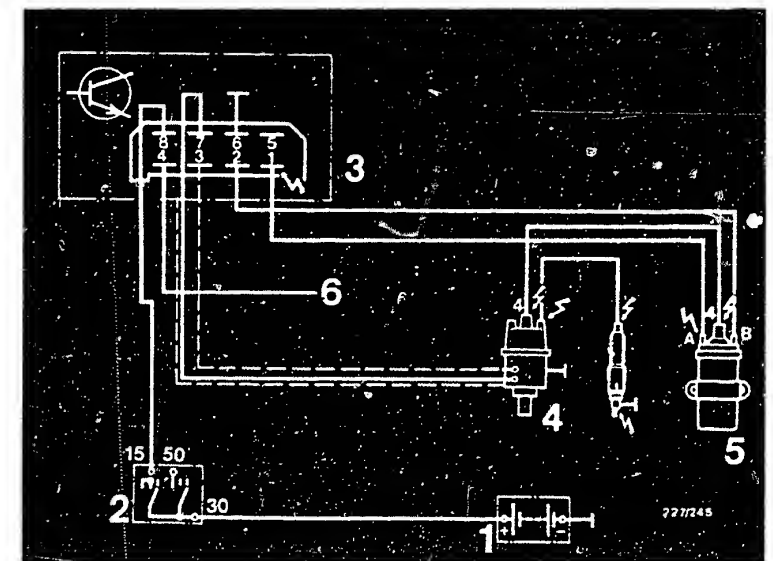
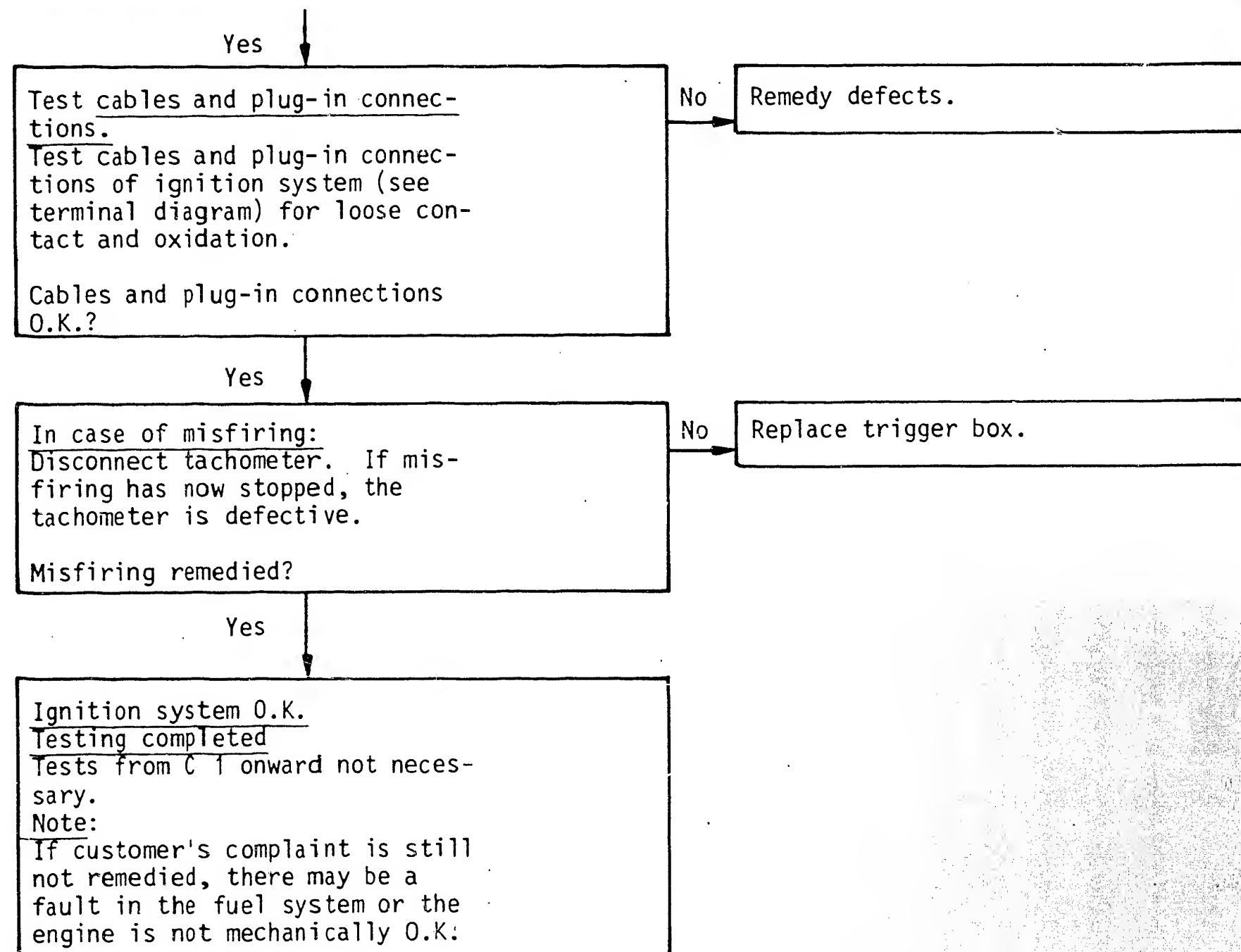
Trouble-shooting program
Lamborghini



B8

Trouble-shooting program
Lamborghini





- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition distributor
- 5 = Ignition transformer
- 6 = to tachometer

⚡ = Dangerous voltages
(400 V - 25 kV)



No ignition spark.
(Continued from B 3)

Test resistance of coil section including electric cable.
Remove trigger-box plug. Connect ohmmeter to disconnected trigger-box plug between term. 3 and term. 7. Ohmmeter must indicate 3.2...5.4 k Ω . Resistance O.K.?

Replace coil section/ignition distributor or electric cable.

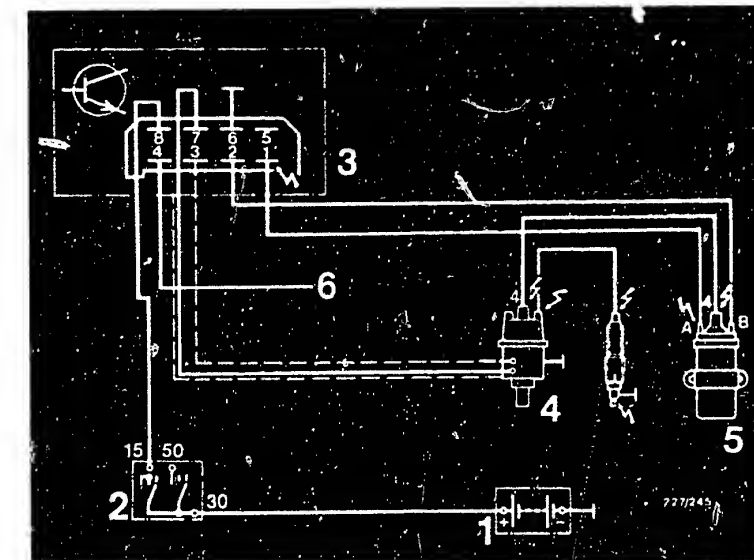
Test short circuit to ground of
coil section and electric cable.
Connect ohmmeter to disconnected
trigger-box plug at term. 3 or
term. 7 and vehicle ground. Ohm-
meter must indicate infinity (∞).
Resistance (∞) O.K.?

Replace coil section/ignition distributor or electric cable.

Test ignition pulse generator for mechanical damage.
Visual examination: Trigger wheel must not rub against teeth of ignition pulse generator. Ignition pulse generator O.K.?

Replace ignition pulse generator/
ignition distributor.

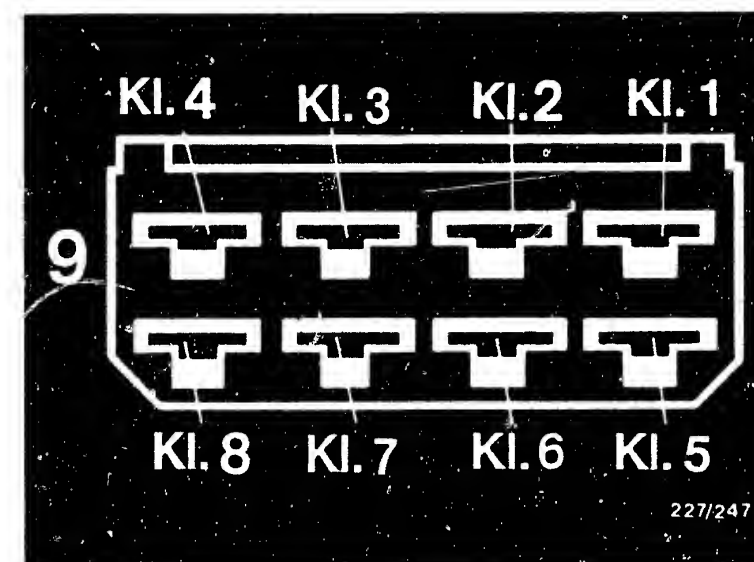
Continued on C3/C4

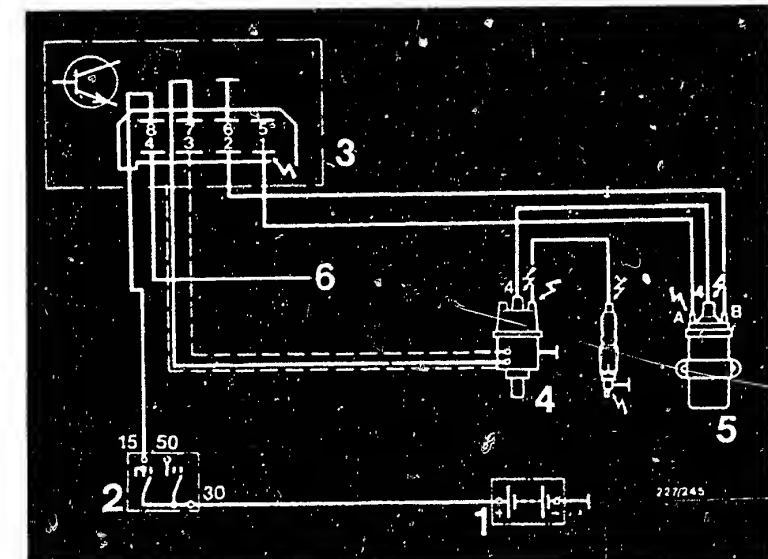
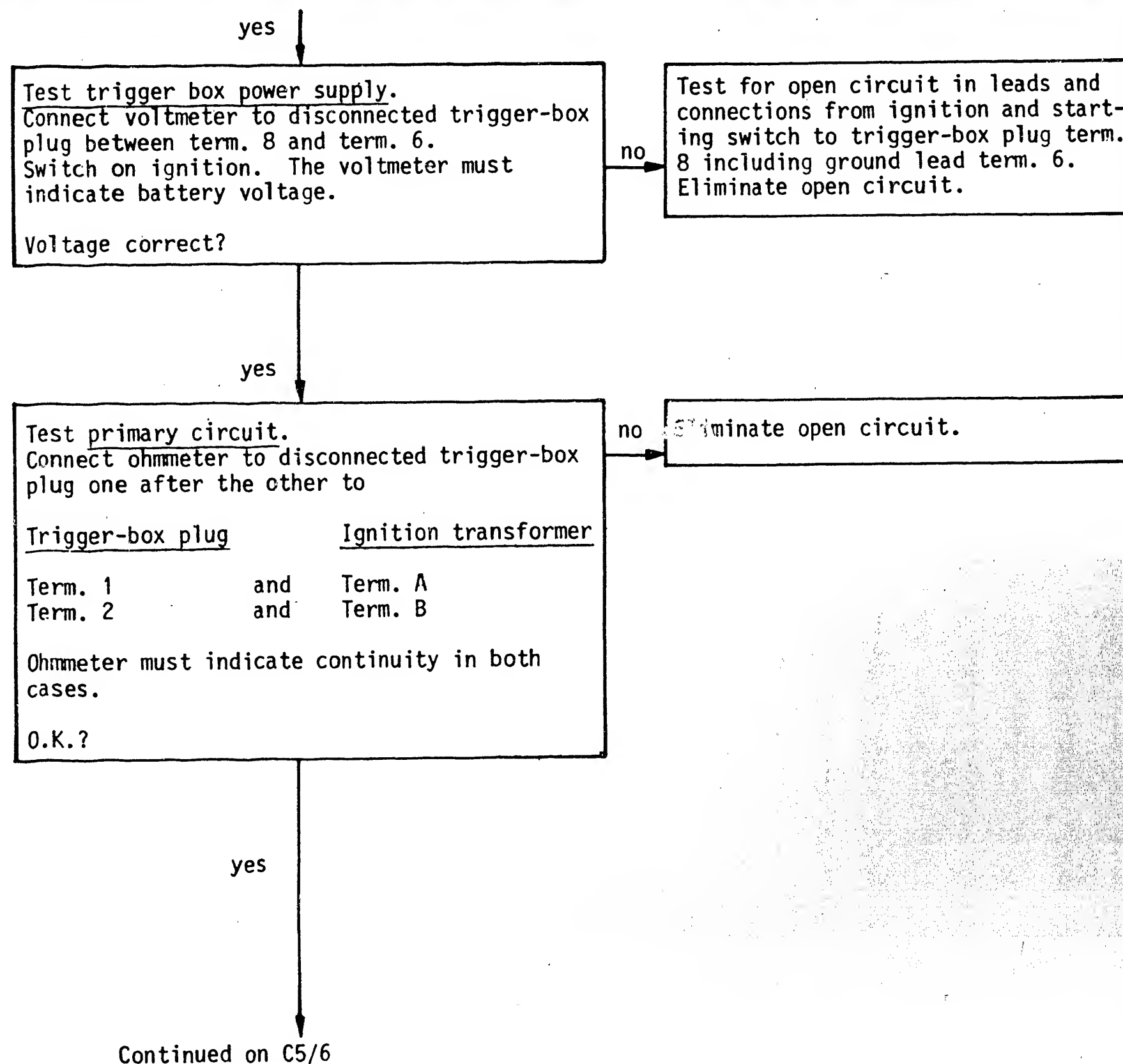


- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition distributor
- 5 = Ignition transformer
- 6 = to tachometer

**⚡ = Dangerous voltages
(400 V - 25 kV)**

9 = Trigger-box plug

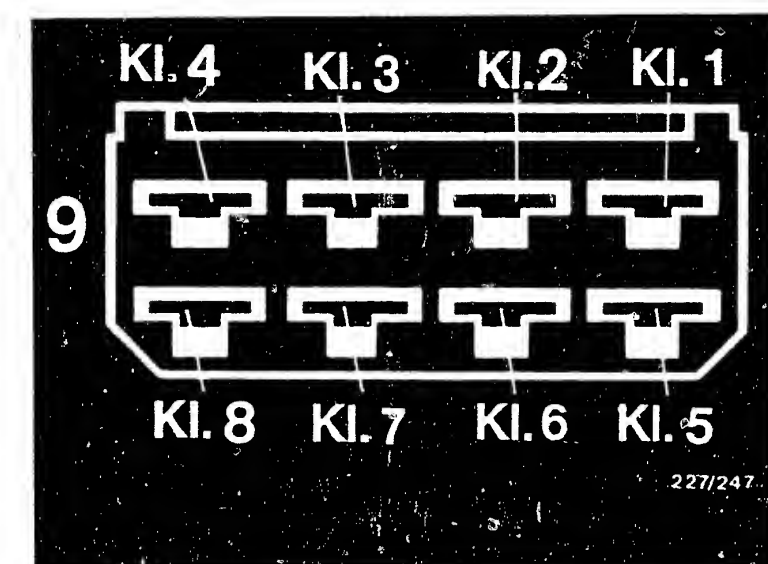




- 1 = Battery
- 2 = Ignition and starting switch
- 3 = Trigger box
- 4 = Ignition distributor
- 5 = Ignition transformer
- 6 = to tachometer

⚡ = dangerous voltages
(400 V - 25 kV)

9 = Trigger-box plug



C3

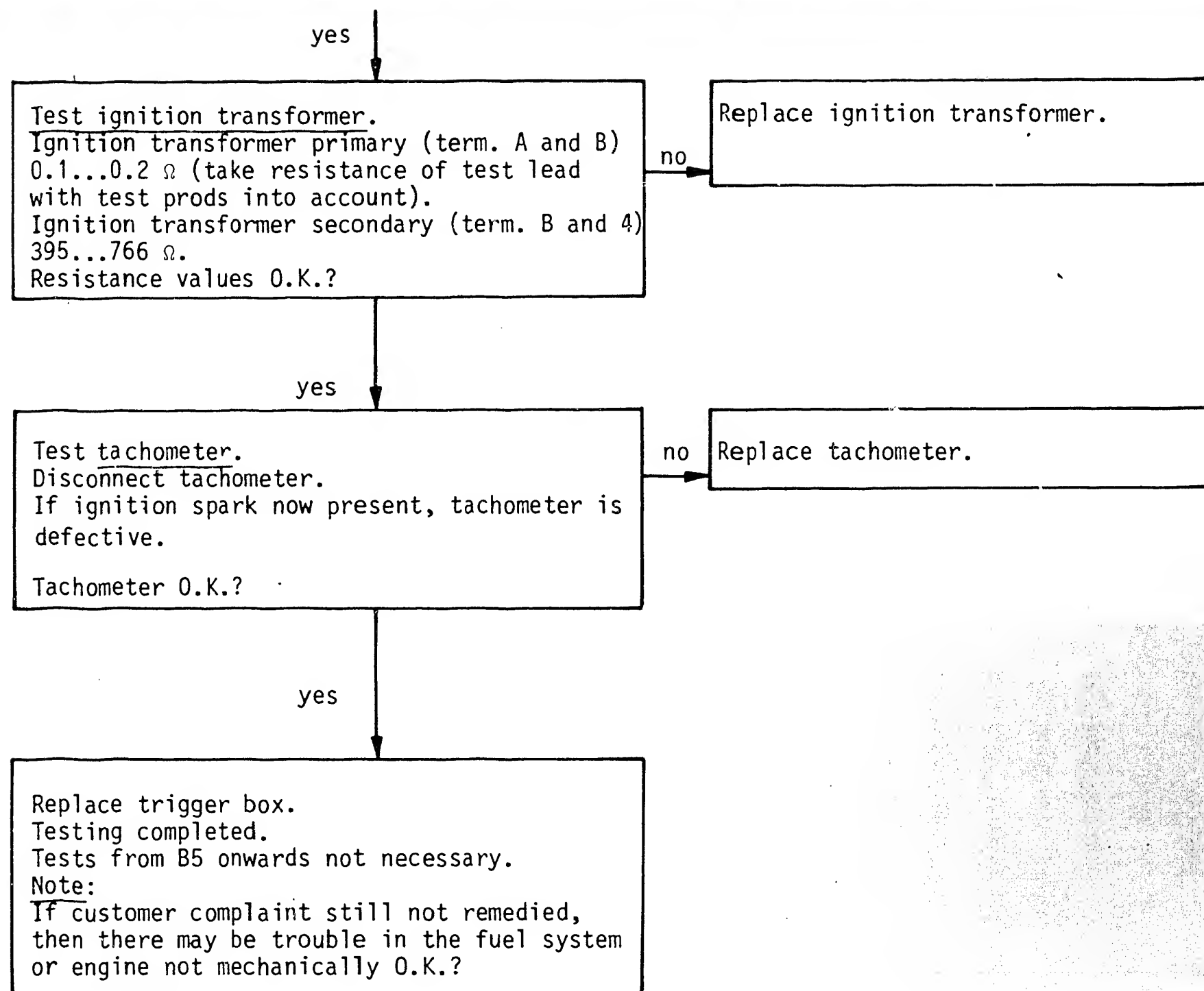
Trouble-shooting program
Lamborghini



C4

Trouble-shooting program
Lamborghini





After-sales Service

Technical Bulletin

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22

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tooth tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only of individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also of the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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L1

Technical Bulletin

Lamborghini

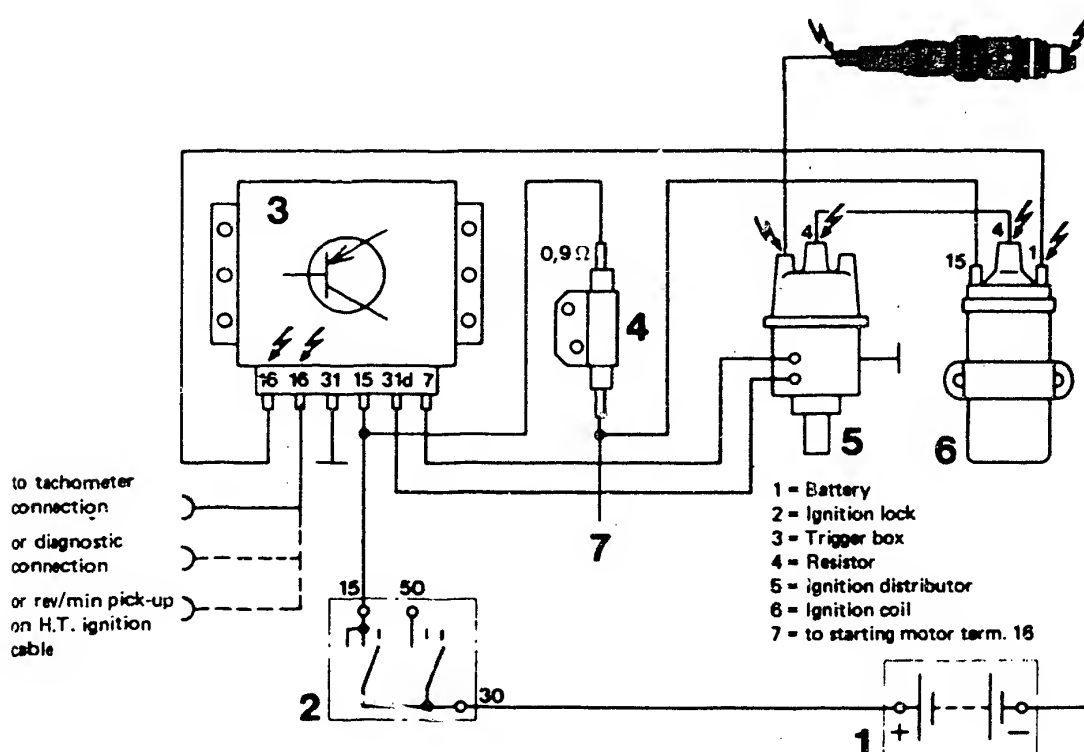


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

After-sales Service

Technical Bulletin

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EFFECTS OF ELECTRICAL AND ELECTRONIC
SYSTEMS ON HEART PACEMAKERS

VDT-1-227/107 En

1.1981

e.g. ignition systems, Jetronic, Motronic, ABS

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).
Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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L3

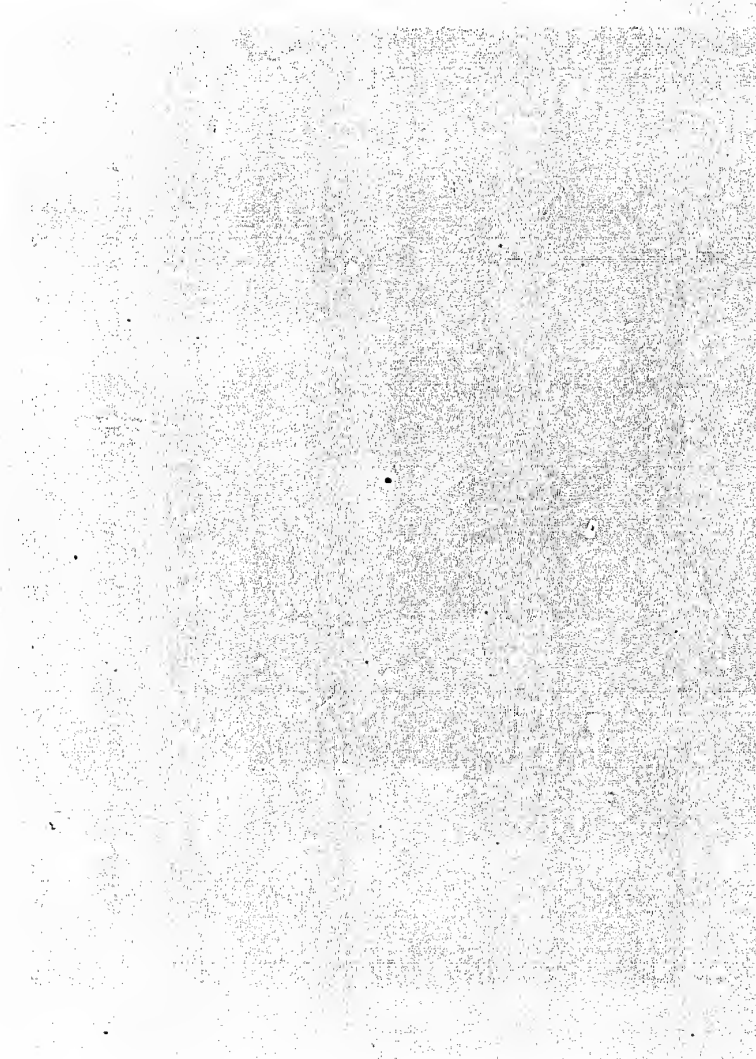
Technical Bulletin

Lamborghini



We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.



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NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En

1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	-----	Mechanical (breaker points).	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)

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L5

Technical Bulletin

Lamborghini



Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributorless ignition with or without knock control	VZ VZ-K	- K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).



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5. Necessary test equipment and aids	A 10
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7. Important vehicle information	A 14
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Test if ignition spark <u>not</u> present	C 1



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